BULLETIN

OF THE

TORREY BOTANICAL CLUB

VOLUME 52

FOUNDED BY WILLIAM HENRY LEGGETT 1870

EDITOR

TRACY ELLIOT HAZEN

ASSOCIATE EDITORS

ALBERT FRANCIS BLAKESLEE
CORNELIA LEE CAREY
ALEXANDER WILLIAMS EVANS
HENRY ALLAN GLEASON
ALFRED GUNDERSEN
GEORGE TRACY HASTINGS
MARSHALL AVERY HOWE
MICHAEL LEVINE
ARLOW BURDETTE STOUT

NEW YORK

1925

PUBLISHED FOR THE CLUB
THE INTELLIGENCER PRINTING COMPANY
LANCASTER, PENNSYLVANIA

NU

general (Science Lib.)
Wahs

CONTENTS

GLEASON HENRY ALLAN. Studies on the flora of northern South America —II. The stellate-tomentose species of *Centropogon* (PLATE 1).... 1
HOLLICK, ARTHUR. A new fossil species of *Hydrangea* (PLATE 2)..... 21
WOOLLETT, EDITH CAROLINE, DORIS LUCILLE DEAN, and HELEN ROSE COBURN. Application of Gleason's formula to a *Carex lasiocarpa* association, an association of few species..... 23
SCHAFFNER, JOHN HENRY. Experiments with various plants to produce change of sex in the individual..... 35
GLEASON, HENRY ALLAN. Studies on the flora of northern South America—III. New or noteworthy species of *Centropogon* and *Siphocampylus* (PLATE 3)..... 49
STOUT, ARLOW BURDETTE. Studies of *Lythrum Salicaria*—II. A new form of flower in this species..... 81
WEATHERWAX, PAUL. Anomalies in maize and its relatives—II. Many-flowered spikelets in maize..... 87
GLEASON, HENRY ALLAN. Studies on the flora of northern South America—IV. The genus *Burmeistera*..... 93
OSTERHOUT, GEORGE EVERETT. The genus *Hymenopappus* in Colorado. 105
BARNHART, JOHN HENDLEY. Eugene Pintard Bicknell (1859–1925) (PORTRAIT)..... 119
CHRYSLER, MINTON ASBURY. *Botrychium lanuginosum* and its relation to the problem of the fertile spike (PLATE 4)..... 127
FERGUSON, WILLIAM CASHMAN. Contributions to the flora of Long Island, New York—Third paper..... 133
RUSBY, HENRY HURD. *Chomelia*, Jacquin and *Anisomeris*, Presl..... 137
RYDBERG, PER AXEL. Notes on Fabaceae—IV. *Xylophacos*..... 143
SHOWALTER, AMOS MARTIN. Germination of the spores of *Riccardia pinguis* and of *Pellia Fabbronia* (PLATE 5)..... 157
WEATHERWAX, PAUL. Anomalies in maize and its relatives—III. Carpellody in maize..... 167
GLEASON, HENRY ALLAN. Studies on the flora of northern South America—V. Miscellaneous new or noteworthy species..... 181
GOLDSTEIN, BESSIE. A study of progressive cell plate formation (PLATE 6) 197
MUNZ, PHILIP ALEXANDER, and IVAN MURRAY JOHNSTON. Miscellaneous notes on plants of Southern California—IV..... 221
RYDBERG, PER AXEL. Notes on Fabaceae—V. *Xylophacos* (continued) 229
WINGARD, SAMUEL ANDREW. Studies on the pathogenicity, morphology, and cytology of *Nematospora Phaseoli* (PLATES 7–9)..... 249
SCHELLING, NELLY JACOB. Growth stimulation of *Aspergillus niger* by a vitamine B preparation..... 291
BUCHHOLZ, JOHN THEODORE. The embryogeny of *Cephalotaxus Fortunei* (PLATE 10)..... 311
GLEASON, HENRY ALLAN. Studies on the flora of northern South America—VI. New or noteworthy species of Melastomataceae.... 325

NICHOLS, SUSAN PERCIVAL. The effect of wounds upon the rotation of the protoplasm in the internodes of *Nitella* 351
RYDBERG, PER AXEL. Notes on Fabaceae—VI. *Xylophacos* (conclusion) 365
GLEASON, HENRY ALLAN. Studies on the flora of northern South America—VII. New or noteworthy species of Melastomataceae—II. 373
TRELEASE, SAM FARLOW. Chamber with thermostatic control and rotating table for plant cultures 389
CASTLE, HEMPSTEAD. A revision of the species of *Radula* of the United States and Canada 409
GLEASON, HENRY ALLAN. Studies on the flora of northern South America—VIII. Additional new species of Melastomataceae 447
ST. JOHN, HAROLD. A critical consideration of Hagström's work on *Potamogeton* 461
EVANS, ALEXANDER WILLIAM. A taxonomic study of *Hymenophytum* ... 491
PICKETT, FERMEN LAYTON and MILDRED EUNICE MANUEL. Development of prothallium and apogamous embryo in *Pellaea glabella* Mettenius 507
PINNICK, ATHA ALVANIA. On the number of chloroplasts in the cells of the sporophyte of *Anthoceros laevis* 515
INDEX TO AMERICAN BOTANICAL LITERARUTE, 26, 75, 109, 171, 237, 341, 397, 473, 519
INDEX TO VOLUME 52 545

Dates of Publication

No. 1, for January	Pages	1–34	Issued January	31, 1925
No. 2, for February	"	35–80	" March	9, 1925
No. 3, for March	"	81–118	" April	25, 1925
No. 4, for April	"	119–180	" May	18, 1925
No. 5, for May	"	181–248	" June	7, 1925
No. 6, for June	"	249–350	" November	4, 1925
No. 7, for October	"	351–408	" November	20, 1925
No. 8, for November	"	409–490	" December	18, 1925
No. 9, for December	"	491–553	" January	5, 1926

Errata

Page 63, line 16, for "*Portoviejo*" read "*Porto Velo, Prov. Oro.*"
Page 118, line 6, for "*Leptaemia*" read "*Leptotaenia.*"
Page 143, line 20, for "*A. arnophyllus*" read "*A. argophyllus.*"
Page 154, line 19, for "*A. unilensis*" read "*A. uintensis.*"
Page 154, line 20, for "*Xylophacos unitensis*" read "*Xylophacos uintensis.*"
Page 195, line 14, for "*Dupata*" read "*Dupatya.*"
Page 222, line 6 from bottom, for "*var. bernardiha*" read "*var. bernardina.*"
Page 229, line 17, for "*A. chamaelucae panguicensis*" read "*A. Chamaeluce panguicensis.*"
Page 234, line 14, for "*H. Newberryi*" read "*X. Newberryi.*"
Page 241, line 21, for [volume] "**38:**" read "**32:**"

Vol. 52 No. 1

BULLETIN
OF THE
TORREY BOTANICAL CLUB

JANUARY 1925

Studies on the flora of Northern South America—II*

H. A. GLEASON

(WITH PLATE 1)

THE STELLATE-TOMENTOSE SPECIES OF CENTROPOGON

The genus *Centropogon*, as represented in northern South America, may be readily divided into a few sections which are at once recognizable by certain very obvious characters. Among these a group of tomentose forms is especially noteworthy because of the characteristic branched hairs, a feature rarely found elsewhere in the genus. In most species, these hairs closely resemble the well-known hairs of *Verbascum Thapsus;* in others, by shortening of the axis and reduction in the number of branches, they are reduced to small stellate structures, and in a few species simple hairs may be found among the branched. These typical hairs are regularly found on the young stems, petioles, and peduncles, and usually as well on the hypanthium and perianth, although in many species they are soon deciduous, leaving parts of the plant essentially glabrous. The flowers are always axillary, the peduncles arising from the axils of the upper leaves; the hypanthium is broadly hemispheric, occasionally varying to short-cylindric; the corolla is brightly colored, except where the surface is concealed by the indument, with a conspicuous tube and strongly decurved, falcate lobes; the two lower anthers are bearded; the fruit is a berry.

The section is best represented in the mountains of Colombia and Ecuador, but extends from this center north into Central America, east into the Andes of Venezuela, and south into Bolivia. The species known to me may be distinguished by the following key.

* Contributions from the New York Botanical Garden—No. 263
[The Bulletin for December (51: 469–512) was issued 17 January 1925]

A. Corolla tube stout and short, rarely twice as long as the lobes; anther-tube densely tomentose, long-exserted; sepals ample or foliaceous, exceeding the hypanthium, the sinuses narrow or acute.
Sepals ovate or ovate-lanceolate, serrate, broadest above the base.
Anther-tube covered with tawny hairs. 1. *C. Mandonis*
Anther-tube covered with purple hairs. 2. *C. gloriosus*
Sepals narrowly triangular, serrate or entire, tapering regularly from the base to the apex.
Corolla externally and lower leaf-surface thinly pubescent. 3. *C. Brittonianus*
Corolla externally and lower leaf-surface densely stellate-tomentose. 4. *C. magnificus*
B. Corolla-tube slender and elongate, 2–5 times as long as the lobes; anther-tube pilose in the fissures to glabrous, the summit of the filaments little if any surpassing the longest corolla-lobes; sepals minute to foliaceous.
Corolla-lobes triangular-falcate, less than twice as long as wide. 5. *C. unduavensis*
Corolla-lobes linear-falcate, usually 3–5 times as long as wide.
*Sepals broad and flat, exceeding the hypanthium, contiguous or nearly so at base, separated by narrow, acute or barely rounded sinuses.
Leaves cinerous on the veins beneath, nearly or quite glabrous above, even when young.
Sepals black beneath the tomentum; leaves obtuse, rounded at the base. 6. *C. Hartwegi*
Sepals green beneath the tomentum; leaves sharply acute.
Sepals ovate, 7–8 mm. wide, broadly overlapping; leaves obtuse at base, on petioles about 1 cm. long. 7. *C. latisepalus*
Sepals oblong, not over 4 mm. wide, not overlapping; leaves acute at base.
Sepals finely denticulate, broadest above the base. 8. *C. Caoutchouc*
Sepals entire, tapering regularly from the base. 9. *C. aurantiacus*
Leaves ferruginous on the veins beneath, thick and firm, freely stellate-pubescent above when young, somewhat so when mature; sepals thickly ferruginous-tomentose.
Leaves of an oblong type, broadest at or above the middle, acute at base.
Leaves obtuse, 4–5 cm. wide. 10. *C. fulvus*

Leaves acuminate, 2–3 cm. wide. 11. *C. Weberbaueri*

Leaves of an ovate type, broadest well below the middle, rounded at base, acute or subacuminate; sepals spreading or reflexed. 12. *C. rufus*

Sepals triangular to linear, equaling or shorter than the hypanthium, 1.5–6 mm. long. (In case of doubt, species with more or less spreading and therefore conspicuous sepals have been placed in the next division, and those with appressed inconspicuous sepals here.) (See also *.)

Sepals triangular, notably broadened to the base and therefore separated by acute sinuses; leaves distinctly rounded and obtuse at the apex. 13. *C. ellipticus*

Sepals linear, with flat sinuses.

Leaves narrowly oblong to lanceolate or linear, rarely exceeding 2 cm. in width; sepals 1–3 mm. long.

Leaves densely ferruginous-tomentose beneath, the actual surface virtually concealed.

Peduncles 5–8 cm. long; upper corolla-lobes 10–12 mm. long. 14. *C. longifolius*

Peduncles 1–2 cm. long, much shorter than the subtending leaves; upper corolla-lobes 8 mm. long. 15. *C. intonsus*

Leaves thinly tomentose to sparsely stellate beneath, the actual surface visible through the indument.

Leaves acuminate at the apex.

Blades lanceolate, about 4 times as long as wide. 16. *C. Jahnii.*

Blades linear, about 8 times as long as wide. 17. *C. lanceolatus*

Leaves acute or obtuse.

Filaments tomentose; leaves repand-denticulate. 18. *C. ferrugineus*

Filaments glabrous; leaves merely callous-denticulate. 19. *C. barbatellus*

Leaves of a broader type, regularly exceeding 2 cm. in width.

Serrations of the leaves 5–8 mm. long; blades ovate, acuminate, cuneate to a slender petiole. 20. *C. australis*

Serrations of the leaf minute.

Sepals 5–6 mm. long; hypanthium minutely wing-angled.

Peduncles densely tomentose; petioles 3–5 cm. long; leaf-blades elliptic or oblong, about twice as long as wide. 21. *C. foliosus*

Peduncles almost or quite glabrous; petioles 1–2 cm. long; leaf-blades broadly round-ovate. 22. *C. alatus*

Sepals 1–3 mm. long; hypanthium densely tomentose.

Leaves rounded or subcordate at base. 23. *C. subcordatus*

Leaves narrowed to the base.

Leaf-blades 5–8 cm. long, obtuse or subacute. 24. *C. salviaeformis*

Leaf-blades 15–20 cm. long, tapering regularly from the middle to both ends. 25. *C. nervosus*

***Sepals linear, exceeding the hypanthium, (6–)7.5–30 mm. long.

Sepals less than 10 mm. long.

Corolla at least 40 mm. long over all.

Leaves obtuse or rounded; stem very densely rough-tomentose.

Leaves obovate, 6–10 cm. long; corolla densely tomentose externally. 26. *C. comosus*

Leaves elliptic, less than 4 cm. long; corolla sparsely stellate-pubescent externally. 27. *C. hirsutus*

Leaves acute to subacuminate, ample; stem closely tomentose. 28. *C. cinereus*

Corolla 25–30 mm. long over all.

Sepals densely stellate-tomentose, the surface hidden, entire or with 1 or 2 low teeth only; leaves narrowed to the base.

Leaves acute, about twice as long as wide. 29. *C. suberianthus*

Leaves obtuse or subacute, 3–4 times as long as wide. 30. *C. Lindenianus*

Sepals thinly stellate-pubescent, the surface visible.

Leaves elliptic, cuneate or subacuminate to the base. 31. *C. licayensis*

Leaves oblong, obtuse to rounded at the base.

Sepals entire; hairs of the peduncle 2 mm. long. 32. *C. occultus*

Sepals prominently and saliently toothed; hairs on the peduncle less than 1 mm. long.

Leaves oblong-ovate, broadest below the middle, long-acuminate. 33. *C. Preslii*

Leaves oblong-obovate, broadest above the middle, acute. 34. *C. Featherstonei*

Sepals more than 10 mm. long.

Sepals densely ferruginous, more or less involute.

Leaves prominently serrate, about 3–4 times as long as wide, not more than 10 cm. long, rounded to broadly obtuse at base. 35. *C. erianthus*

Leaves minutely denticulate, about twice as long as wide, 12–18 cm. long, acute at base. 36. *C. pichinchensis*

Sepals flat.

Veins almost completely obscured on the lower leaf-surface by the dense tomentum. 37. *C. verbascifolius*

Veins prominent on the lower leaf-surface, merely marked by tomentum.

Sepals 12–15 mm. long; leaves elliptic-rhomboid, cuneate from above the middle to the base. 38. *C. Macbridei*

Sepals 25–30 mm. long; leaves oblong, rounded at the base. 39. *C. perlongus*

1. CENTROPOGON MANDONIS Zahlbr. Ann. Naturh. Hofmus. Wien 6: 438. 1891.

Mandon 494, Prov. Larecaja, Bolivia.

2. CENTROPOGON GLORIOSUS (Britton) Zahlbr. Bull. Torrey Club 24: 373. 1897.

Siphocampylus gloriosus Britton, Bull. Torrey Club 19: 373. 1892.

Rusby 647 (type), Unduavi, Bolivia; *Rusby 645*, Sorata, Bolivia; *Bang 2620* (Bolivia); *Buchtien 471* (Herb. N. Y. Bot. Gard.), Unduavi; *Buchtien 735*, Unduavi; *Buchtien 736* (National Herb.), Unduavi.

3. CENTROPOGON BRITTONIANUS Zalbr. Bull. Torrey Club 24: 373. 1897.

Siphocampylus giganteus latifolius Britton, Bull. Torrey Club 19: 373. 1892.

Rusby 638 (type), Unduavi, Bolivia; *Bang 738*, Yungas, Bolivia; *Buchtien*, Unduavi; *Buchtien 471* (Gray Herb.), Unduavi; *Buchtien 736* (Herb. N. Y. Bot. Gard., National Herb.), Unduavi.

4. CENTROPOGON MAGNIFICUS Zahlbr. & Rech. Med. Rijks Herb. 13: 50. 1913.

Steinbach 5011, Dept. Cochabamba, Bolivia.

5. CENTROPOGON UNDUAVENSIS (Britton) Zahlbr. Bull. Torrey Club 24: 374. 1897.

Siphocampylus unduavensis Britton, Bull. Torrey Club 19: 373. 1892.

Rusby 649 (type), Unduavi, Bolivia; *Buchtien 128, 733, 3016*, Unduavi.

6. CENTROPOGON HARTWEGI (Benth.) Benth. & Hook. f.; B. D. Jackson, Ind. Kew. 4: 1274. 1895.

Siphocampylus Hartwegi Benth. Pl. Hartw. 139. 1844.

Hartweg 777 (type), Loxa, Ecuador.

7. **Centropogon latisepalus** n. sp.

Stem apparently shrubby, strongly angled and flattened, densely cinereous-tomentose when young, becoming thinly tomentose 3 dm. from the summit; internodes 15–20 mm. long; petioles stout, 8–10 mm. long, tomentose like the stem; leaf-blades spreading, thin and membranous, broadly elliptic-oblong, 8–11 cm. long, 4.5–5 cm. wide, the uppermost a trifle smaller, sharply acute or subacuminate, minutely denticulate with low, salient, callous, triangular teeth (6–7 teeth per cm. of margin, 0.2 mm. high), broadly cuneate or obtuse at base, above very thinly stellate-pubescent on the surface, or glabrous with age, densely brown-stellate along the midvein and lower portion of the laterals, beneath softly and thinly stellate on the surface and densely so on the principal veins with cinereous tomentum; lateral veins 15–18 pairs, broadly ascending, conspicuously arcuate; peduncles axillary, ascending, stout, 7–8 cm. long, densely cinereous-tomentose, subulate-bracteolate near the base; hypanthium broadly depressed-hemispheric, 8 mm. high, 12 mm. wide when pressed, closely but densely cinereous-tomentose; sepals erect, foliaceous, ovate-elliptic or ovate, 18 mm. long, 7–8 mm. wide, broadly overlapping, short-acuminate, thinly stellate on the back, inconspicuously reticulate, the exposed margin denticulate like the leaves, the concealed margin subentire; sinuses narrow, acute; corolla red, cinereous-stellate or subtomentose, the tube 40 mm. long, the lobes linear-falcate, strongly decurved, the upper about 9 mm., the lateral about 6, the lower 4 mm. long; filaments thinly pilose, exserted 6 mm.; anther-tube 7 mm. long, strongly hirsute on the connectives on the distal half, the two lower anthers bearded.

TYPE: *Pittier 739*, collected Dec. 1905, Cuestá de Tocotá, road from Buenaventura to Cali, Dept. El Valle, Colombia, altitude 1500–1900 m., and deposited in the herbarium of the New York Botanical Garden.

8. **Centropogon Caoutchouc** (H.B.K.) n. comb.

Lobelia Caoutchouc H.B.K. Nov. Gen. & Sp. 3: 304. 1818.
Centropogon luteus Wimmer, Repert. Spec. Nov. 19: 247. 1924.

Humboldt & Bonpland (type), Popayan Andes; *Goudot; Linden 1072* (type of *C. luteus* Wimmer), Quindio; *Pennell 8872*, near Salento, Dept. Caldas, alt. 2100–2500 m., 25–31 July 1922; *Killip & Hazen 9561*, between Rio Toche and "Machin," Old Quindio Trail, Dept. Tolima, alt. 2000–2500 m., 3 Aug. 1922.

9. **Centropogon aurantiacus** n. sp.

Stem shrubby, closely stellate-tomentose above, becoming glabrous 3 dm. from the summit, internodes 2–5 cm. long; petioles slender, 10–13 mm. long, thinly tomentose; leaf-blades firm, elliptic, the largest 85 mm. long, 35 mm. wide, sharply acute or abruptly short-acuminate, obtuse or rounded at the base, subentire or minutely denticulate with low, black, callous, salient teeth (about 6 teeth per cm. of margin, 0.3 mm. high), the upper surface thinly and minutely stellate, with inconspicuous veins, the lower surface thinly but conspicuously stellate and densely cinereous-tomentose on the prominently reticulate veins; lateral veins about 10 pairs, strongly ascending; peduncles axillary, 5–6 cm. long, equaling the subtending leaves, thinly stellate-tomentose; hypanthium hemispheric, 8 mm. long, 13 mm. wide when pressed, 10-ribbed, closely and densely ferruginous-tomentose; sepals erect, linear, 17 mm. long, 2 mm. wide, tapering regularly to the tip, entire, 1-nerved, inconspicuously reticulate, thinly stellate, especially at the margin, separated by broadly rounded sinuses 2 mm. wide; corolla orange-red, thinly stellate, the tube 30 mm. long, the lobes strongly falcate and decurved, the upper 9 mm. long, the lateral and lower much shorter; filaments exserted 5 mm., thinly hirsute; anther-tube 7 mm. long, densely hirsute on the connectives, the two lower anthers bearded.

TYPE: *Killip & Hazen 9623*, collected 3 Aug. 1922, between "El Eden" and "La Palmilla," Old Quindio Trail, Dept. Tolima, Colombia, altitude 1800–2300 m., and deposited in the herbarium of the New York Botanical Garden. Other collections are *Spruce 5576*, Ecuador, and *Heilborn 453*, Garnetas, Ecuador.

10. **Centropogon fulvus** n. sp.

Stem shrubby, climbing, strongly angled and flattened above, closely brown stellate-tomentose when young, glabrescent in age, the internodes 15–20 mm. long; petioles stout, 1–2 cm. long, tomentose like the stem; leaf-blades firm, narrowly elliptic-

obovate to elliptic-oblong, broadest at or above the middle, the largest 5 by 14 cm., the upper gradually reduced, obtuse, or rounded and minutely apiculate, finely denticulate (about 8 teeth per cm. of margin) with low, black, callous, triangular, salient teeth 0.3 mm. long and not surpassing the tomentum, cuneate or subacute at base, upper surface dull green with prominently impressed veins, thinly ferruginous-stellate when young, glabrous at maturity, the mid-vein and lower part of the laterals permanently and densely tomentose, lower surface closely ferruginous-tomentose, especially on the veins; lateral veins 16–22 pairs, arcuately ascending, the veinlets conspicuously reticulate; peduncles axillary, slender, 7–8 cm. long, shorter than the subtending leaves, strongly angled, tomentose like the stem; hypanthium broadly hemispheric, strongly ribbed, 7 mm. high, 14 mm. wide when pressed, densely tomentose; sepals erect, elliptic-oblong, 11–14 mm. long, 4–5 mm. wide, acute, tapering to a base 2 mm. wide, with about 6 black callous teeth on each side, densely and closely tomentose within and without, separated by narrow rounded sinuses; corolla purple-red, densely tomentose with orange-colored stellate hairs, the tube 30 mm. long, the lobes narrowly triangular-falcate and decurved, the upper 9 mm. long, the lower much shorter; filaments villous, especially on the ventral side, not exserted; anther-tube 8 mm. long, densely hirsute on the fissures distally with orange-colored hairs, the two lower anthers bearded.

TYPE: *Pennell & Killip 7382*, collected 28 June 1922, at "San Jose," San Antonio, Dept. El Cauca, altitude 2400–2700 m., and deposited in the herbarium of the New York Botanical Garden.

11. CENTROPOGON WEBERBAUERI Zahlbr. Bot. Jahrb. **37**: 453. 1906.

Weberbauer 3247 (type, not *3347*, as cited by Zahlbr.), Huamalies, Peru.

12. CENTROPOGON RUFUS Wimmer, Repert. Spec. Nov. **19**: 249. 1924.

Macbride 4473, Tambo de Vaca, Peru.

13. **Centropogon ellipticus** n. sp.

Stem herbaceous, strongly angled and flattened above, densely tomentose when young with dark brown, stellate hairs, becoming glabrous 3–4 dm. from the summit, the internodes 2–3 cm. long; petioles stout, 8–12 mm. long, tomentose like the stem; leaf-blades firm, elliptic, the largest 12 cm. long, 4.5 cm. wide,

rounded at the apex, entire or with minute black intramarginal teeth, rounded to broadly obtuse at base, thinly stellate above when young with dark brown hairs, glabrescent at maturity on the surface, persistently tomentose on the midvein and base of the lateral veins, thinly tomentose beneath on the surface and densely so on the veins with ferruginous branched hairs; lateral veins about 16 pairs, slightly arcuate, ascending, veinlets inconspicuously reticulate; peduncles axillary, stout, ascending or nodding at the tip, 6–7 cm. long, shorter than the subtending leaves, tomentose like the stem; hypanthium broadly hemispheric, 7–8 mm. high, 12 mm. broad when pressed, conspicuously ribbed, densely stellate-tomentose; sepals erect, broadly triangular with concave sides, 3–4 mm. long and wide, densely tomentose; corolla orange, the lobes yellow within, thinly stellate-tomentose, the tube 23 mm. long, the upper lobes 9 mm., the lower 5 mm. long; filaments glabrous, exserted 5 mm.; anther-tube 6 mm. long, glabrous, the two lower anthers bearded.

TYPE: *Pennell 2486*, collected 13–15 Oct. 1917, near Sibate, Dept. Cundinamarca, Colombia, altitude 2900–3000 m., and deposited in the herbarium of the New York Botanical Garden. Other collections are *Holton*, Bogota; *Pennell 2419*, El Peñon, near Sibate, 13 Oct. 1917; *Pennell 9232*, "Pinares" above Salento, Dept. Caldas, alt. 2600–2900 m., 2–10 Aug. 1922; and *Killip & Bro. Ariste-Joseph 11,941*, Paramo de Choachi, near Bogota, 3700 m., 8 Aug. 1922.

14. CENTROPOGON LONGIFOLIUS Wimmer, Repert. Spec. Nov. 19: 246. 1924.

Siphocampylus barbatus Benth. Pl. Hartw. 139. 1844.

Matthews 1186 (type), Huanacabra, Peru; *Jameson 18; Hitchcock 21,616*, Prov. Azuay, Ecuador; *Macbride 4445*, Tambo de Vaca, Peru; *Hartweg 778* (type of *S. barbatus* Benth.), Loxa, Ecuador.

15. **Centropogon intonsus** n. sp.

Stems woody, hollow, strongly angled and more or less compressed above, densely and coarsely ferruginous-tomentose when young, glabrous in age, the internodes very short; petioles stout, 4 mm. long, tomentose like the stem; leaf-blades narrowly oblong, thick and firm, 30–55 mm. long, 7–14 mm. wide, acute at both ends, denticulate with black, callous, barely salient, mostly intramarginal teeth, the upper surface rugulose, dull green, thinly fulvous-stellate, particularly at the margin, with deeply impressed veins, the lower surface densely and persistently ferruginous-tomentose, especially on the 8–12 pairs of arcuately ascending

lateral veins; peduncles axillary, slender, 1–2 cm. long, much shorter than the subtending leaves, pubescent like the stem; hypanthium urceolate-hemispheric, 3 mm. high, 5 mm. wide when pressed, densely tomentose; sepals broadly triangular, 1 mm. long and wide, mucronate, entire, densely tomentose, separated by broad flat sinuses; corolla red, thickly ferruginous-stellate, the tube 28 mm. long, the lobes linear-falcate, decurved, the upper 8 mm. long, the lower shorter; filaments exserted about 7 mm., rather densely villous with short white hairs; anther-tube 5 mm. long, sparsely pilose with short pale hairs, the two lower anthers conspicuously bearded.

TYPE: *Rose, Pachano & Rose 23,173*, collected 28 Sep. 1918, near Las Juntas, Ecuador, and deposited in the United States National Herbarium.

16. **Centropogon Jahnii** n. sp.

Stems apparently herbaceous, strongly angled and flattened, thinly stellate above, soon becoming glabrous, the internodes about 1 cm. long; petioles slender, 1 cm. long, thickly stellate dorsally; leaf-blades thin, dull green, lanceolate, 6–8 cm. long, 15–22 mm. wide, gradually tapering to a sharply acute or subacuminate tip, acute or subcuneate at base, finely and sharply serrulate, the serrations tipped with black, callous teeth, somewhat roughened above with thin stellate pubescence, particularly on the veins, sparsely stellate beneath; lateral veins faint, irregularly ascending, about 12 pairs, the veinlets reticulate; peduncles axillary, slender, 5–6 cm. long, sparsely stellate below, nearly glabrous above; hypanthium depressed-hemispheric, 4 mm. long, 7 mm. wide when pressed, thinly stellate; sepals erect, appressed, triangular, 1.5–2 mm. long, acute, entire, sparsely stellate, separated by broad flat sinuses; corolla red, tipped with yellow, very sparsely stellate, the tube 35 mm. long, the lobes linear-falcate, decurved, the upper 8 mm. long, the lower shorter; filaments exserted 3 mm., minutely villous; anther-tube 7 mm. long, sparsely pilose with long white hairs, the two lower anthers bearded.

TYPE: *Jahn 917*, collected 21 Jan. 1922, on the Páramo de Canaguá, Mérida, Venezuela, altitude 2500 m., and deposited in the United States National Herbarium. A second collection is *Jahn 916*, of the same place and date.

17. CENTROPOGON LANCEOLATUS Wimmer, Repert. Spec. Nov. **19**: 245. 1924.

Jahn 1025, Páramo de Aricagua, Mérida, Venezuela.

18. **Centropogon ferrugineus** (L.f.) n. comb.

Lobelia ferruginea L.f. Suppl. 394. 1781.
Lobelia barbata Cav. Icon. 6: 12. pl. 519. 1801.
Siphocampylus ferrugineus G. Don, Gen. Syst. 3: 701. 1834.
Siphocampylus barbatus G. Don, *l.c.* 1834.
Centropogon barbatus Planch. Flore Serres 6: 16. 1850–1851.

Colombia, without detail of locality: *Bonpland, Triana 1574, 1575, Dawe 347;* vicinity of Bogota; *Ariste-Joseph, Holton 407, Parseval-Grandmaison, André 721, Purdie, Triana 69;* Páramo Oruiza: *Purdie;* Guasca: *Ariste-Joseph;* Dept. Caldas: *Dawe 745;* Dept. Cundinamarca: *Pennell 1933.*

Centropogon ferrugineus parviflorus (Zahlbr.) n. comb.

Centropogon barbatus parviflorus Zahlbr. Ann. Naturh. Hofmus. Wien 6: 436. 1891.

André 4004, Ecuador; *Heilborn 715*, Ecuador.

19. **Centropogon barbatellus** n. sp.

Stems woody, possibly climbing, strongly grooved, densely stellate above with pale brown tomentum, becoming glabrous 3–4 dm. from the summit, the internodes 5–10 mm. long; petioles stout, 5–8 mm. long, densely stellate-tomentose; leaf-blades thin, narrowly oblong or elliptic-oblong, 4–8 cm. long, 1–2.5 cm. wide, acute or subacuminate, obtuse to broadly acuminate at the base, minutely denticulate with low, broadly triangular, salient, callous teeth (about 5 teeth per cm. of margin, 0.4 mm. high), varying to entire, thinly stellate above when young, particularly along the plane midvein, becoming glabrous at maturity, permanently stellate beneath with cinereous hairs, especially along the veins; lateral veins about 12 pairs, arcuately ascending, hardly apparent above, the veinlets obscure; peduncles axillary, slender, 25–40 mm. long, exceeding the subtending leaves, thinly stellate-tomentose; hypanthium broadly hemispheric, 5 mm. high, 8 mm. wide when pressed, densely and closely stellate-tomentose; sepals erect, narrowly triangular, 3 mm. long, 1 mm. wide at the base, entire, thinly tomentose, separated by broad flat sinuses; corolla red without, yellow within, thinly and sparsely stellate, the tube 25 mm. long, the lobes narrowly falcate and depressed, the upper 7 mm., the middle 5 mm., the lower 4 mm. long; filaments exserted about 10 mm., glabrous; anther-tube nearly straight, black, glabrous, the two lower anthers strongly bearded.

TYPE: *Pennell 3115*, collected 15–17 Dec. 1917, at "Rosalito," near Páramo de Ruiz, Dept. Tolima, Colombia, altitude 2900–3200 m., and deposited in the herbarium of the New York

Botanical Garden. Other collections are *Triana 1577; Schlim 420;* and *Pennell 9233*, "Pinares" above Salento, Dept. Caldas, alt. 2600–2900 m., 2–10 Aug. 1922.

20. **Centropogon australis** (Wimmer) n. comb.

Centropogon grandidentatus australis Wimmer, Repert. Spec. Nov. **19**: 245. 1924.

Funcke 1062 (type), Venezuela; *Linden 404*, Venezuela. The similarity in leaf-form between this species and *C. grandidentatus* (Schlecht.) Zahlbr. is striking, but the Mexican species is not stellate-pubescent.

21. CENTROPOGON FOLIOSUS Rusby, Descr. S. Am. Pl. 146. 1920.

Smith 1385 (type), Santa Marta, Colombia.

22. **Centropogon alatus** n. sp.

Stems strongly angled and more or less flattened, thinly stellate above, soon becoming glabrous, the internodes 5–20 mm. long; petioles slender, strongly flattened, dilated at the base, thinly stellate, 1–2 cm. long; leaf-blades broadly round-ovate, thin, 5–7 cm. long, 3.5–5 cm. wide, subacuminate to a rounded and mucronate tip, broadly rounded below to an abruptly cuneate base, sharply and prominently spinulose-denticulate (5 or 6 teeth per cm. of margin, 0.5 mm. long), upper surface dark green, thinly pubescent with scattered, simple or sparingly branched hairs, lower surface thinly stellate with cinereous hairs; lateral veins 8–12 pairs, spreading almost at right angles, crooked, irregularly arcuate, the veinlets reticulate; peduncles axillary, slender, 5–6 cm. long, almost glabrous, bibracteolate near the base; hypanthium broadly hemispheric, 5 mm. high, 9 mm. wide when pressed, thinly stellate, narrowly 10-winged; sepals triangular, dilated at base, 5 mm. long, 2 mm. wide, acute, with 1 or 2 prominent teeth, thinly stellate; corolla red, the tube 30–35 mm. long, almost glabrous, the lobes linear-falcate, strongly decurved, the upper 10 mm., the lower 8 mm. long; filaments barely exserted, sparsely pubescent; anther-tube 8 mm. long, glabrous, the two lower anthers bearded.

TYPE: *Jahn 1026*, collected 31 Mar. 1922, on the Páramo de Aricagua, Mérida, Venezuela, altitude 2000 m., and deposited in the United States National Herbarium.

23. CENTROPOGON SUBCORDATUS Zahlbr. Repert. Spec. Nov. **14**: 140. 1915.

Sodiro 91/4 (type), Palmira, Ecuador; *Jameson 102; Pennell 10,468*, Cerro Tatama, Dept. Caldas, Colombia, alt. 2000–3000 m.; *Macbride 2125*, Huanuco, Peru.

24. CENTROPOGON SALVIAEFORMIS Zahlbr. Repert. Spec. Nov. 14: 138. 1915.

Sodiro 91/5 (type), Cavaron, Ecuador; *Heilborn 453*, Ecuador.

25. **Centropogon nervosus** Wimmer, n. sp.

Stem shrubby, strongly angled and flattened above, thinly stellate-tomentose with cinereous hairs, soon glabrescent, the internodes 5–10 mm. long; petioles slender, 15–25 mm. long, pubescent like the stem, eventually becoming glabrous; leaf-blades thin, elliptic-rhomboid, broadest near the middle, 21 cm. long, 7 cm. wide, the upper gradually reduced, tapering regularly to an acute or subacuminate apex, cuneate to the base, sharply and minutely denticulate (about 8 teeth per cm. of margin) with black, callous, salient teeth 0.2–0.3 mm. long, both surfaces thinly stellate with cinereous hairs, more densely along the veins; lateral veins numerous, 4–5 mm. apart, almost straight, ascending at an angle of 70°, the veinlets finely reticulate; peduncles axillary, stout, 4–5 cm. long, densely cinereous-tomentose; hypanthium broadly hemispheric, 4 mm. high, 7 mm. wide when pressed, densely cinereous-tomentose; sepals erect or appressed, narrowly triangular, 3 mm. long, 1.5 mm. wide, acute, entire, thinly stellate, the sinuses broad and flat; corolla red, densely tomentose, the distal portion and anthers lacking.

TYPE: *Cook & Gilbert 1347*, collected 19 June 1915, in the Lucomayo Valley, Peru, altitude 1800–3600 m., and deposited in the United States National Herbarium.

Strongly suggestive of *C. foliosus* Rusby in its leaf-form, and of *C. verbascifolius* (Presl) Gleason and *C. Macbridei* Gleason in its venation, but differing from both in the short sepals. The species was first recognized as distinct by Wimmer, who examined the type specimen and suggested the name; the description above is my own.

26. **Centropogon comosus** n. sp.

Stem shrubby, strongly angled and somewhat flattened, densely and coarsely cinereous-tomentose with stellate hairs above, somewhat smoother below, the internodes about 1 cm. long; petioles stout, 15–30 mm. long, tomentose like the stem; leaf-blades thick and firm, elliptic-obovate, the largest 9 cm. long and 5 cm. wide, the upper somewhat reduced, rounded to broadly obtuse and sometimes minutely apiculate at the apex, broadest near the middle or somewhat above it, subcuneate to an obtuse base, entire or minutely denticulate with barely salient teeth (about 6 teeth per cm. of margin, 0.2 mm. long), but apparently ciliate by the projecting tomentum, the upper

side dull green, slightly rugose, and permanently scabrellate with stellate hairs, especially along the midvein, the lower side roughly and densely tomentose with cinereous branched hairs, especially along the veins; lateral veins 10–14 pairs, widely divergent, barely arcuate, somewhat impressed above, strongly elevated beneath, the veinlets reticulate; peduncles axillary, stout, ascending, 6–8 cm. long, tomentose like the stem; hypanthium broadly hemispheric, 6 mm. high, 12 mm. broad when pressed, densely and coarsely stellate-tomentose; sepals linear, erect, 9 mm. long, entire, densely stellate-tomentose, separated by broadly rounded sinuses; corolla probably red, but the surface entirely concealed by heavy, coarse, rough, brown, stellate tomentum, the tube 38 mm. long, the lobes narrowly linear-falcate, strongly decurved, the upper 10 mm. long, the lower shorter; filaments sparsely villous, exserted 5–7 mm.; anther-tube 8–9 mm. long, sparsely pilose with a few long hairs in the fissures, especially dorsally, the two lower anthers bearded.

TYPE: *Hitchcock 21,545*, collected 7 Sep. 1923, between San Lucas and Oña, province of Loja, Ecuador, altitude 2200–3100 m., and deposited in the herbarium of the New York Botanical Garden. Another collection is *Rose, Pachano & Rose 23,151*, from Zaragura, Ecuador.

27. **Centropogon hirsutus** n. sp.

Stems apparently shrubby, densely stellate-tomentose above with dark brown hairs, the upper internodes 1–2 cm. long; petioles stout, 4–8 mm. long, tomentose like the stem; leaf-blades firm, dark green, broadly elliptic, 3–3.5 cm. long, 13–18 mm. wide, broadest about the middle, broadly rounded and callous-apiculate at the apex, rounded or broadly obtuse at base, remotely and minutely denticulate with black callous teeth (about 5 teeth per cm. of margin, 0.2–0.3 mm. high), thinly stellate on the midvein above when young, glabrous on the surface, beneath pale green, the prominently reticulate veins mostly concealed by the persistent, somewhat floccose, dark brown, stellate tomentum; peduncles axillary, stout, erect, 6–7 cm. long, twice as long as the subtending leaves, densely brown-tomentose; hypanthium deeply hemispheric, 7 mm. high, 9 mm. wide when pressed, obscurely angled, densely brown-tomentose; sepals erect or somewhat spreading, linear, 7–8 mm. long, acuminate to a black callous tip, remotely callous-denticulate, thinly and irregularly stellate; corolla red, sparsely and thinly stellate, the tube 30 mm. long, 10 mm. wide at the throat, the lobes linear-falcate, strongly decurved, the upper 13 mm., the lower 11 mm. long; filaments barely exceeding the corolla, nearly glabrous; anther-tube 8 mm. long, somewhat pubescent at the base, the two lower anthers bearded.

TYPE, *Dawe 743*, collected 1918, Dept. Caldas, Colombia, and deposited in the herbarium of the New York Botanical Garden.

28. **Centropogon cinereus** n. sp.

Stems shrubby, climbing, channelled above and densely pubescent with ferruginous branched hairs, becoming terete and glabrous with age; internodes elongating to 2–3 cm. long; petioles slender, flattened, densely tomentose, 15–30 mm. long; blades thin, broadly elliptic, the largest 18 cm. long by 9 cm. wide, the upper smaller, seldom exceeding 10 cm. long by 5 cm. wide on the terminal two decimeters of stem, sharply acute or subacuminate, minutely denticulate (7–9 teeth per cm. of margin) with low (0.5 mm.), black, callous, salient, sharply triangular teeth, broadly cuneate at base, upper surface dull green, ferruginous with stellate hairs when young, becoming glabrous on the surface at maturity, tardily glabrescent on the midvein, lower surface stellate-tomentulose on the surface, stellate-tomentose on the principal veins; lateral veins 16–20 on each side, prominent beneath, lightly impressed above, ascending and gently arcuate; peduncles from the upper axils, 1–2 cm. long, slender, densely ferruginous-tomentose; hypanthium broadly hemispheric, 5 mm. high, 8 mm. wide when pressed, densely ferruginous-tomentose; sepals erect, linear, 7–8 mm. long, entire, thinly tomentose, separated by flat sinuses wider than the sepals; corolla red, ferruginous-tomentulose, the tube 35 mm. long, the upper lobes about 12 mm. long, the laterals about 6, the lower about 4; filament-tube exserted about 9 mm., thinly pubescent; anther-tube 8 mm. long, strongly pilose on the fissures distally, the two lower anthers bearded.

TYPE: *Pennell 10,724*, collected 18–19 Sep. 1922 at "Buenos Aires," north of Supia, Dept. Caldas, Colombia, altitude 2000–2300 m., and deposited in the herbarium of the New York Botanical Garden. Other examples are *Pennell 10,743*, same date and locality, *Triana 84*, Quindio; *Jervise* without number, Quindio.

29. CENTROPOGON SUBERIANTHUS Zahlbr. Repert. Spec. Nov. **14**: 134. 1915.

Lehmann 5932 (type), Popayan Andes, Colombia.

30. CENTROPOGON LINDENIANUS Wimmer, Repert. Spec. Nov. **19**: 246. 1924.

Linden 1212 (type), near Bogota, Colombia; *Linden 837; Jameson 56, 144; Pennell 7089*, "Paletara" to "Calaguala,"

Dept. El Cauca, Colombia, alt. 3000–3200 m., 17 June 1922; *Pennell 9375*, "Alaska" above Salento, Dept. Caldas, Colombia, alt. 3100–3700 m., 7 Aug. 1922.

31. **Centropogon licayensis** n. sp.

Stem apparently shrubby, densely gray-brown stellate-tomentose above, glabrescent with age, the floriferous internodes much abbreviated; petioles slender, 12–14 mm. long, densely and closely tomentose; blades broadly elliptic, thin and membranous, 8–11 cm. long, 4–5.5 cm. wide, broadest near the middle, sharply acute at the apex, cuneate or subacuminate at the base, minutely but prominently denticulate with black, callous, salient teeth (5–8 teeth per cm. of margin, 0.5 mm. long or less), thinly stellate on the surface, densely so on the midvein above, thinly stellate on the surface, densely so on the midvein and laterals beneath; peduncles axillary, 2–3 cm. long, densely cinereous-tomentose; hypanthium hemispheric, 5 mm. high, 7 mm. wide when pressed, densely cinereous-tomentose; sepals erect, narrowly linear, 8 mm. long, densely stellate, rarely with 1 or 2 callous teeth, the sinuses broadly rounded, wider than the sepals; corolla red, the tube 23 mm. long, rather densely stellate, the lobes linear-falcate, strongly decurved, the upper about 12 mm. long, the lower much shorter; filaments conspicuously and softly villous; anther-tube 6–7 mm. long, sparsely pilose in the fissures, the two lower anthers penicillate.

TYPE: *Rose & Rose 23,837*, collected 28 Aug. 1918, at Huigra, Ecuador, on the Hacienda de Licay, and deposited in the United States National Herbarium.

32. **Centropogon occultus** n. sp.

Stems woody, probably climbing, densely shaggy with dark brown branched hairs when young, becoming glabrous with age, strongly flattened, the floriferous internodes 10 mm. long, later elongating to 5 cm.; petioles stout, 7 mm. long, densely shaggy; leaf-blades firm, oblong, 8–10 cm. long, 3–3.5 cm. wide, broadest near the middle, acute, broadly obtuse to rounded at the base, indistinctly repand, minutely and remotely callous-denticulate, the teeth mostly hidden within the projecting tomentum, upper surface rough with mostly simple, straight, deciduous hairs as much as 1 mm. long, lower surface at first densely shaggy with dull brown branched hairs, later becoming merely thinly stellate, except along the midvein; lateral veins 5–10 mm. apart, faintly impressed above, prominently elevated and almost superficial beneath, crooked, irregularly ascending, the veinlets reticulate; peduncles axillary, 5 cm. long, densely shaggy with brown hairs;

hypanthium deeply hemispheric, 8 mm. high, 9 mm. wide when pressed, prominently angled, densely brown-tomentose; sepals erect, linear, 7 mm. long, thin and flat, densely beset with long brown branched hairs, the sinuses flat, much wider than the sepals; corolla thinly pubescent with long branched hairs, red, the tube 23 mm. long, 8 mm. wide at the throat, upper lobes about 10 mm., the lower about 4 mm. long; filaments exserted 8 mm., glabrous; anther-tube 7 mm. long, thinly hirsute dorsally toward the summit; fruit a densely tomentose dry berry.

TYPE: *Rose, Pachano & Rose 23,945* collected 28 Sep. 1918, at Zaragura, Ecuador, and deposited in the United States National Herbarium.

33. CENTROPOGON PRESLII Wimmer, Repert. Spec. Nov. **19**: 248. 1924.

Spruce 5022 (type), Ecuador; *Hall*, valley of Baños, Ecuador; *Pachano 214, 215, 216*, Ambato, Ecuador.

34. **Centropogon Featherstonei** n. sp.

Stem climbing, 3–7 m. long, suffruticose or shrubby, densely and coarsely tomentose above with ferruginous branched hairs, eventually glabrescent, the floriferous internodes less than 1 cm. long, becoming 2–3 cm. long at maturity; petioles stout, densely tomentose, 6–8 mm. long; blades soft when pressed, apparently somewhat succulent when fresh, oblong, the largest 11 cm. long by 4 cm. wide, the upper a third smaller, broadly rounded at the base, then gradually expanding with straight or concave sides to the maximum width above the middle, thence sharply acute or subacuminate to the apex, sharply and finely denticulate (about 8 teeth per cm. of margin) with low (0.5 mm.), sharp, callous, salient teeth, rugulose and thinly stellate-pubescent on the upper surface when young, more densely and permanently so on the midvein, densely, softly, and persistently ferruginous-tomentose on the lower surface; lateral veins about 15–18 on each side, widely divergent, gently arcuate, lightly impressed above, prominently elevated beneath, the veinlets obscure; peduncles from the upper axils, slender, divergent, 6–8 cm. long, somewhat shorter than the subtending leaves, densely ferruginous-tomentose; hypanthium hemispheric, 5 mm. high, 8–10 mm. wide when pressed, somewhat angled, densely ferruginous-tomentose; sepals erect or somewhat spreading, linear, 6–7 mm. long, dark brown or nearly black, with 2 or 3 pairs of black, salient, acicular teeth; corolla-tube 28 mm. long, apparently red, but the surface concealed by dense ferruginous tomentum, the lobes narrow, falcate, depressed, the upper about 10 mm., the lateral about 7, the lower about 5 mm. long; filaments thinly

villous, exserted about 13 mm.; anther-tube 8 mm. long, sparsely pilose distally, the two lower anthers bearded.

TYPE, *Macbride & Featherstone 1605*, collected 8–22 July 1922 at Mito, Peru, altitude about 9000 feet, and deposited in the herbarium of the New York Botanical Garden (dupl. in herb. Field Museum).

35. CENTROPOGON ERIANTHUS (Benth.) Benth. & Hook. f.; B. D. Jackson, Ind. Kew **4:** 1274. 1895.

Siphocampylus erianthus Benth. Pl. Hartw. 139. 1844.

Hartweg 778 (type), Loxa (= Loja), Ecuador; *Triana 1559; Rose, Pachano & Rose 23,147*, Zaragura, Ecuador; *Hitchcock 21,376*, Loja, Ecuador; *Mille 360*, Ecuador.

36. CENTROPOGON PICHINCHENSIS Zahlbr. Repert. Spec. Nov. **14:** 180. 1915

Sodiro 91/2 (type), Pichincha, Ecuador; *Macbride 4306*, Muña, Peru.

37. **Centropogon verbascifolius** (Presl) n. comb.

Lobelia verbascifolia Presl, Prodr. Monog. Lobel. 38. 1836.
Siphocampylus verbascifolius A. DC. Prodr. **7:** 402. 1839.

Matthews, Peru. Closely resembling the next in leaf-form and venation, but distinguished by the more densely tomentose leaves and by the smaller flowers, with a corolla-tube only 21 mm. long.

38. **Centropogon Macbridei** n. sp.

Stems shrubby, climbing, 5 m. long, irregularly compressed and densely ferruginous with stellate tomentum when young, becoming glabrous with age; floriferous internodes 1–2 cm. long, gradually lengthening at maturity; petioles stout, 9–15 mm. long, densely brown-tomentose; blades spreading or somewhat ascending, thin, elliptic-oblong to elliptic-rhomboid, broadest somewhat above the middle, 10–12 cm. long, 4–4.5 cm. wide, the upper gradually reduced, subacuminate, cuneate from the middle or a little below it to an acute base, conspicuously denticulate (about 7 teeth per cm. of margin) with thick, black, callous, triangular teeth, 0.7 mm. long or less, upper surface rough with stellate pubescence, thinly on the surface, densely along the midvein, especially toward its base, lower surface similarly pubescent on the surface and with rows of crowded hairs on the veins and veinlets; midvein impressed or plane above, stout and

elevated beneath; lateral veins 3–5 mm. part, obscure above, prominulous beneath, gently curved-ascending; peduncles 7–11 cm. long, densely tomentose, minutely subulate-bracteolate near the base; hypanthium broadly hemispheric, 8 mm. high, 12 mm. broad when pressed, somewhat 5-ribbed, densely tomentose; sepals erect or ascending, linear-triangular, 12–15 mm. long, densely pubescent, with a few minute callous teeth, especially in the distal half, separated by flat sinuses 3 mm. wide; corolla orange-red without, yellow within, stellate-tomentose, the tube 35–40 mm. long, constricted above the base, gradually expanding to 10 mm. wide at the throat when pressed, its lobes linear-triangular, strongly decurved-falcate, long-acuminate, more or less involute, the two upper 4–5 mm. wide at base, about 20 mm. long, the lower narrower and shorter; filaments exserted 12–17 mm., straight, puberulous at the throat, becoming pilose or subtomentose with white hairs toward the apex; anther-tube 9–10 mm. long, purplish-brown, glabrous, or with scattered pilose pubescence on the connectives, the two lower anthers bearded; fruit a dry berry.

TYPE: *Macbride 4183*, collected 20 May to 1 June 1923, Huacachi, near Muña, Peru, altitude about 6500 feet, and deposited in the herbarium of the New York Botanical Garden (dupl. in herb. Field Museum); a second collection is *Pennell 7455*, Mount Santa Ana, Dept. El Cauca, Colombia, alt. 2700–3000 m., 29–30 June 1922.

39. **Centropogon perlongus** n. sp.

Tall shrub, the stems somewhat flattened above, irregularly angled, densely tomentose with fulvous hairs, glabrescent in age; petioles 15 mm. long, densely tomentose; leaf-blades thin, oblong to oblong-lanceolate, those subtending flowers 11–15 cm. long, 3.5–5 cm. wide, the lower still larger, acute or subacuminate, obtuse to subrotund at base, prominently callous-denticulate (5–8 teeth per cm. of margin) or serrulate, above dark green, thinly fulvous-stellate on the surface, more densely so on the principal veins, beneath pale green, thinly cinereous-stellate on the surface, densely so on the veins; lateral veins 18–22 pairs, slightly arcuate, ascending at angles of 45–70°, impressed above, prominent beneath; peduncles axillary, 13–15 cm. long, densely tomentose, later glabrescent, the bracts linear-subulate, 3 mm. long; hypanthium short-cylindric, 12 mm. long and wide when pressed, strongly angled, densely fulvous-stellate; sepals loosely and irregularly spreading or even reflexed, linear, 25–30 mm. long, 2–3 mm. wide, remotely denticulate with low, black, callous teeth, densely fulvous-stellate on both surfaces, later glabrescent; corolla densely fulvous-tomentose, the tube 42 mm. long, the

lobes all strongly deflexed, the upper pair 22 mm. long; filaments sparsely villous with vertical white hairs; anther-tube 10 mm. long, strongly hirsute in the fissures with yellow hairs, especially distally; berry broadly ellipsoid, 3 cm. long, crowned by the persistent sepals 5–6 cm. long.

TYPE: *Cook & Gilbert 1355*, collected 19 June 1915, in the Lucomayo Valley, Peru, altitude 1800–3600 m., and deposited in the United States National Herbarium. The type is in flower and bud; a second sheet collected the same day exhibits a lower portion of the stem, with fruit and with more elongate leaves.

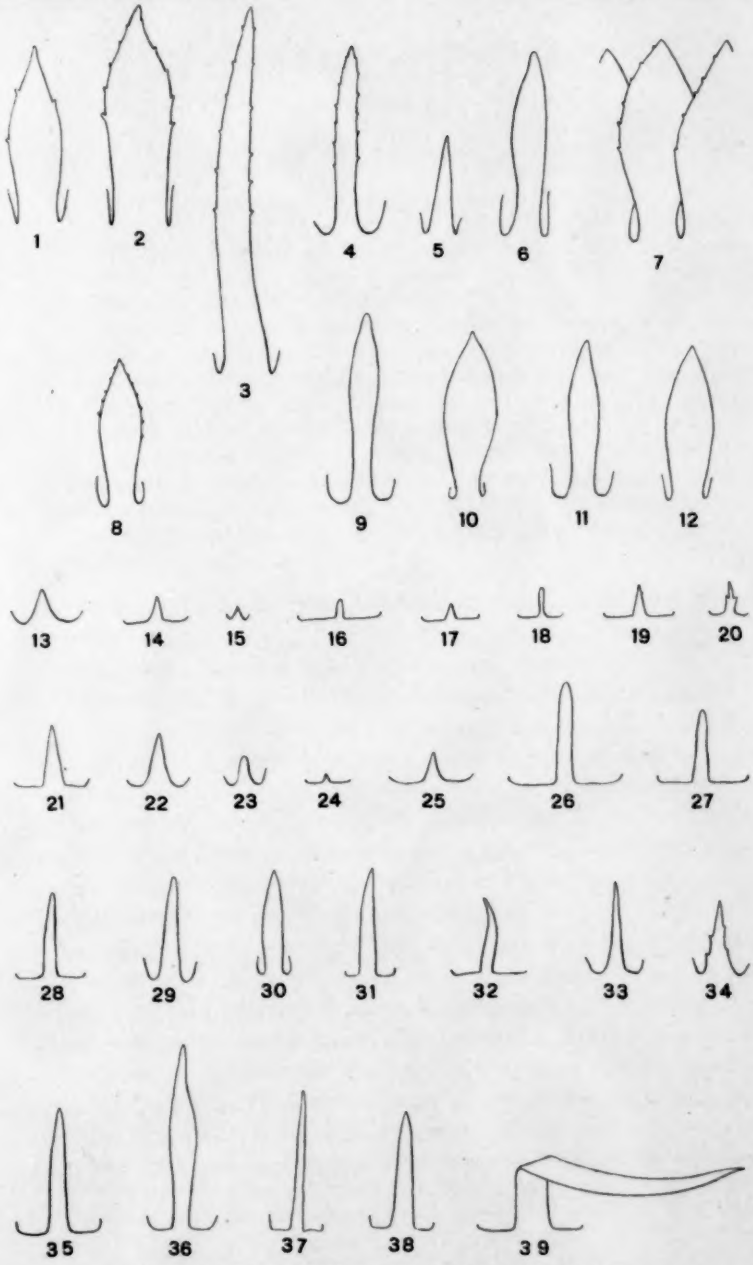
ADDITIONAL SPECIES UNKNOWN TO ME

C. acrodentatus Wimmer, Repert. Spec. Nov. **19**: 241. 1924.
G. affinis venezuelanus Wimmer, *l. c.* 242. 1924.
C. Brittonianus brevidentatus Zahlbr. & Rech., Med. Rijks Herb. **19**: 51. 1913.
C. eborinus Wimmer, *l. c.* 244. 1924.
C. erythraeus Drake, Jour. de Bot. **3**: 237. 1889.
? *C. exasperatus* Presl, Prodr. Monog. Lobel. 48. 1836.
C. floccosus Planch., Flore Serres **6**: 16. 1850–51.
C. hirtiflorus Drake, *l. c.* 239. 1889.
C. Karstenii Zahlbr., Ann. Naturh. Hofmus. Wien **6**: 436. 1891.
C. macrocarpus Zahlbr., Bot. Jahrb. **37**: 452. 1906.
C. rubiginosus Wimmer, *l. c.* 249. 1924.

Explanation of plate 1

Sepals of stellate-tomentose Centropogons, × 1.5

1. C. Mandonis.
2. C. gloriosus.
3. C. Brittonianus.
4. C. magnificus.
5. C. unduavensis.
6. C. Hartwegi.
7. C. latisepalus.
8. C. Caoutchouc.
9. C. aurantiacus.
10. C. fulvus.
11. C. Weberbaueri.
12. C. rufus.
13. C. ellipticus.
14. C. longifolius.
15. C. intonsus.
16. C. Jahnii.
17. C. lanceolatus.
18. C. ferrugineus.
19. C. barbatellus.
20. C. australis.
21. C. foliosus.
22. C. alatus.
23. C. subcordatus.
24. C. salviaeformis.
25. C. nervosus.
26. C. comosus.
27. C. hirsutus.
28. C. cinereus.
29. C. suberianthus.
30. C. Lindenianus.
31. C. licayensis.
32. C. occultus.
33. C. Preslii.
34. C. Featherstonei.
35. C. erianthus.
36. C. pichinchensis.
37. C. verbascifolius.
38. C. Macbridei.
39. C. perlongus.



STELLATE-TOMENTOSE CENTROPOGONS

UNIV. OF MICH.

A new fossil species of Hydrangea*

ARTHUR HOLLICK

(WITH PLATE 2)

Hydrangea alaskana n. sp.

Calyx deeply 3-lobed, attached by a common base to a long, slender peduncle; lobes separate, sessile, entire, suborbicular in shape, rounded distally, broadly cuneate proximally, more or less overlapping medianly, varying somewhat in size, 3 or more centimeters in length by 3 or more centimeters in width; nervation pinnate-flabellate, consisting of a straight midvein and three or four secondaries on each side, all of equal rank, that spring from the base and below the median part of the midvein at acute angles of divergence, the inner ones subacrodrome, the outer ones more spreading, occasionally forked or branched, curving upward, connected by irregularly disposed and angled cross nervation, the ultimate ramifications becoming camptodrome in the marginal region. (Pl. 2, FIGS. 1, 2.)

Locality: Jaw Mountain, Alaska Peninsula, 20 miles N.W. of Aniakchak Bay.

Formation: Tertiary shaly sandstone.

Collector: W. R. Smith, U. S. Geological Survey. 1922.

FIGS. 1 and 2, which serve to illustrate the species, represent counterparts of a single specimen. This specimen may be seen tc include not only the conspicuous sepals of a sterile floret but also, apparently, indications of the remains of a scattered cluster of small fertile flowers. These latter appear to the best advantage in the lower portion of the matrix in FIG. 1; but their identification should be regarded as tentative only.

Reference of our specimen to the genus *Hydrangea* appears to be warranted, as may be seen by comparison with the sterile florets of certain existing species of the genus. A drawing of a normal 4-sepalate specimen of *H. quercifolia* Bartram is introduced for comparison (see FIG. 3); but certain Asiatic species, such as *H. Davidi*, *H. hortensis*, and *H. opuloides*, approach our specimen more nearly in regard to size. Incidentally it may be remarked that our species has only three visible sepals, whereas

* Published with the permission of the Director of the U. S. Geological Survey.

the normal number in the sterile florets of existing species is four, or occasionally five. Many, however, present the appearance of being tri-sepalate, for the reason that at least one of the sepals is frequently aborted and is either inconspicuous or early deciduous (see FIG. 4); and in this connection it is of interest to note that of the two figured specimens of the fossil species *Hydrangea Bendirei* (Ward) Knowlton, introduced for comparison, one (see FIG. 5) is shown with four sepals and one (see FIG. 6), apparently, with three.

A number of species, most of them more or less similar to ours, but smaller, from Tertiary horizons in both the Old World and the New, were described and figured under the genera *Getonia*, *Porana*, and *Hydrangea*,* by various authors, from time to time, and were subsequently shifted from one genus to another by those who studied them more critically. The species cited in the footnote may be regarded as examples of three that simulate ours quite closely and apparently belong in the same generic category.

Explanation of plate 2

FIGS. 1, 2. *Hydrangea alaskana* n. sp. Natural size. Specimens in U. S. National Museum, Washington, D. C.

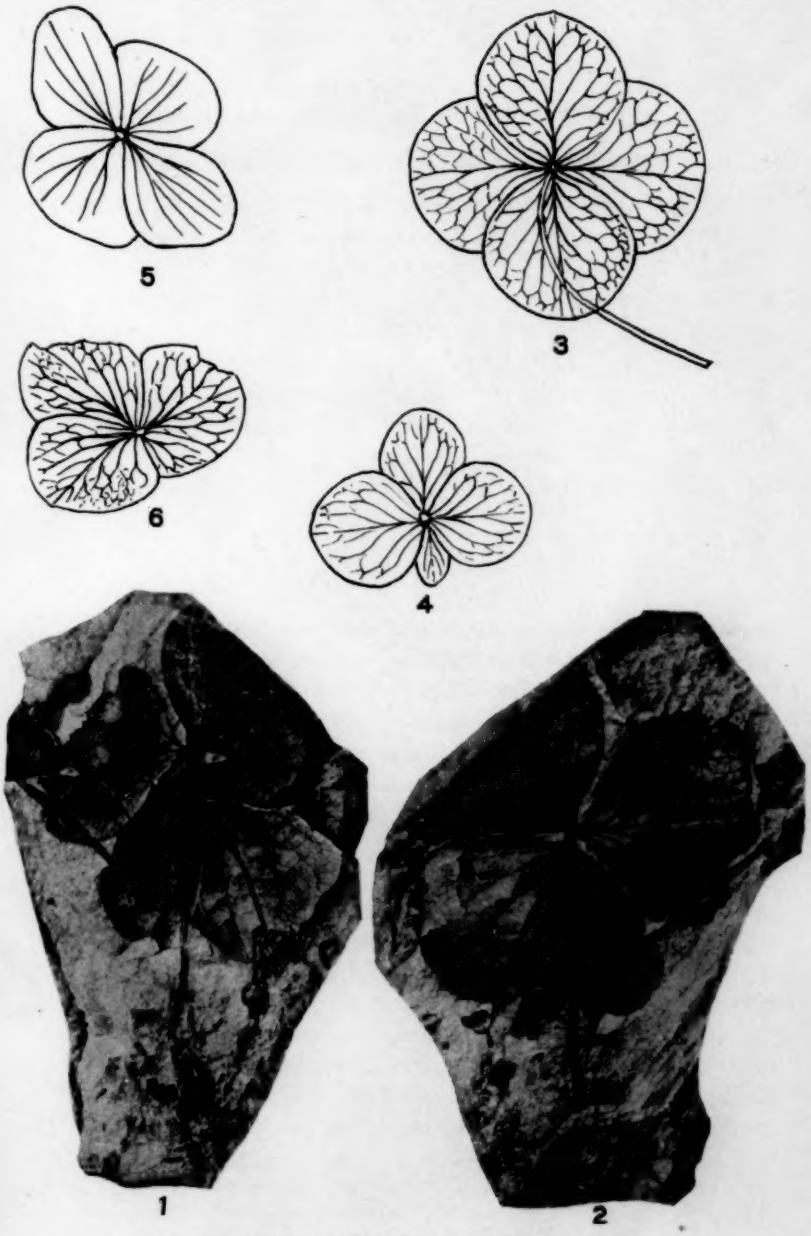
FIGS. 3, 4. *Hydrangea quercifolia* Bartram. Sterile florets, natural size. Alabama, H. Eggert, 1897. Specimens in Herbarium, New York Botanical Garden. (Introduced for comparison.)

FIGS. 5, 6. *Hydrangea Bendirei* (Ward) Knowlton. U. S. Geol. Survey, Bull. No. 204: *pl. 9. f. 6, 7.* (Introduced for comparison.)

* *Getonia oeningensis* Unger, *fide* Weber, C.O., Die Tertiarflora der Niederrheinischen Braunkohlenformation. Paleontographica **2**: 215 [101]. *pl. 7. f. 2.* 1851 [reprint 1852] (= *Viburnum Weberi* Schenk).

Porana oeningensis (Alex. Braun) Heer, Flora tertiaria Helvetiae **3**: 18. *pl. 103. f. 21, 25–28.* 1859 (= *Antholithes oeningensis* Alex. Braun).

Hydrangea Bendirei (Ward) Knowlton, U. S. Geol. Survey, Bull. No. 204 (Fossil flora of the John Day Basin, Oregon): 60. *pl. 9. f. 6, 7.* 1902 (= *Porana Bendirei* (Ward) Lesquereux = *Marsilea Bendirei* Ward).



NEW FOSSIL SPECIES OF HYDRANGEA

UNIV. OF MICH.

Application of Gleason's formula to a Carex lasiocarpa association, an association of few species*

EDITH WOOLLETT, DORIS DEAN AND HELEN COBURN

Efforts have been made by Arrhenius, Gleason, and others to find a mathematical expression for the number of species in a given area. These efforts resulted in a formula by Gleason,† based upon intensive and extensive work in associations of a fairly large number of species such as pine and aspen growth and in certain beech-maple areas. The formula is as follows:

If A is the area of one quadrat, B is the area of total quadrats, C is the area under consideration, a is the average number of species in one quadrat, b is the total number of species in all quadrats examined, and c is the total number of species in the area, then

$$\frac{\log B - \log A}{\log C - \log A} = \frac{b - a}{c - a}.$$

As this formula was developed for a very heterogeneous situation with a large number of species, it was desirable to try the formula on a simple association of a relatively small number of species. For this purpose, Smith's Bog, Cheboygan County, Michigan, a *Carex lasiocarpa* stage in bog development, offered itself as an example.

Looking at the bog from the upland surrounding it, the general appearance is that of a mat of almost pure *Carex lasiocarpa* with a small pond near the center. The *Carex* mat covers an area of over 23,000 square meters, or about five acres. Surrounding this mat on the northern, western, and eastern sides are representatives of the high-bog-shrub association in which *Salix pedicellaris* is most abundant. A lowland forest occupies a slight depression at the southern end.

In applying the formula, lines wholly within the obvious *Carex* association were definitely located. Contiguous quadrats one square meter in size were taken on each side of these lines, totalling 1050 quadrats.

---

* A contribution from the Biological Station of the University of Michigan, in which the authors were students under Professor F. C. Gates.

† Gleason, H. A. Species and area. Ecology 6: No. 1. 1925.

A plane table map was made of the bog and the limits of the *Carex lasiocarpa* association, from which the area of the association was calculated.

TABLE OF SPECIES FOUND IN QUADRATS AND THE NUMBER OF QUADRATS IN WHICH EACH OCCURRED WITH THE FREQUENCY INDICES CALCULATED.

	Quadrats	F.I.
1. Carex lasiocarpa	1050	100
2. Dulichium arundinaceum	390	37.1
3. Eleocharis palustris	380	36.2
4. Potamogeton heterophyllus	240	22.8
5. Eleocharis acuminata	207	19.7
6. Juncus canadensis	135	12.9
7. Carex crinita	94	8.9
8. Lysimachia terrestris	61	5.8
9. Potentilla palustris	51	4.9
10. Chamaedaphne calyculata	50	4.8
11. Hypericum virginicum	36	3.4
12. Nymphaea advena	28	2.7
13. Carex stricta	27	2.6
14. Eriophorum viridicarinatum	14	1.3
15. Panicularia borealis	9	0.9
16. Calamagrostis canadensis	9	0.9
17. Menyanthes trifoliata	2	0.2
18. Carex sterilis	1	0.1
19. Salix pedicellaris	1	0.1
20. Salix sericea	1	0.1
21. Sparganium minimum	1	0.1

The average number of species in the 1050 quadrats was 2.65. In addition to the species found in the quadrats taken in the *Carex* mat, the following species of higher plants were found on the mat:

Andromeda glaucophylla, *Lysimachia thyrsiflora*,
Eriophorum callithrix, *Polygonum amphibium*,
Iris versicolor, *Scirpus atrocinctus*, and
Juncus brachycarpus, *Typha latifolia*,

making a total of 29 species on the mat.

Returning to the formula:

$$\frac{\log B - \log A}{\log C - \log A} = \frac{b - a}{c - a},$$

the values obtained in the investigation were as follows:

A = 1 square meter	a = 2.65
B = 1050 square meters	b = 21
C = 23,159 square meters	c = 29

Substituting all but c in the formula gives:

$$\frac{\log 1050 - \log 1}{\log 23{,}159 - \log 1} = \frac{21 - 2.65}{c - 2.65}.$$

Solving for c, we find $c = 29.16$. Since the actual number of species is 29, the error between the real and the expected number is 0.55%.

The results of the calculations show that the formula may be applied to a given area in which an association predominates, whether large, as in the aspens, or small, as in the present case. The results also show that the total number of species within the area and not merely those belonging to the association itself must be considered.

Summary

1. Efforts have been made to find a mathematical expression for the number of species in a given area.

2. The expression formulated by Gleason:

$$\frac{\log B - \log A}{\log C - \log A} = \frac{b - a}{c - a},$$

in which A is the area of one quadrat, B is the area of total quadrats, C is the area under consideration, a is the average number of species per qudrat, b is the total number of species in the quadrats, and c is the total number of species in the area, had been shown to apply to an association of a large number of species, as the aspen association, but it is now found to apply also to an association of a small number of species, as exemplified by the *Carex lasiocarpa* association at Smith's Bog, Cheboygan County, Michigan.

3. The formula applies to the total number of species present in an area of an association whether they properly belong to the association in question or not.

INDEX TO AMERICAN BOTANICAL LITERATURE
1924

The aim of this Index is to include all current botanical literature written by Americans, published in America, or based upon American material; the word America being used in the broadest sense.

Reviews, and papers that relate exclusively to forestry, agriculture, horticulture, manufactured products of vegetable origin, or laboratory methods are not included, and no attempt is made to index the literature of bacteriology. An occasional exception is made in favor of some paper appearing in an American periodical which is devoted wholly to botany. Reprints are not mentioned unless they differ from the original in some important particular. If users of the Index will call the attention of the editor to errors or omissions, their kindness will be appreciated.

This Index is reprinted monthly on cards, and furnished in this form to subscribers at the rate of three cents for each card. Selections of cards are not permitted; each subscriber must take all cards published during the term of his subscription. Correspondence relating to the card issue should be addressed to Bibliographer of the Torrey Club, N. Y. Botanical Garden, Bronx Park, N. Y. City.

Adams, H. R. Some effects of sulphur on crops and soils. Soil Sci. **18**: 111–115. Au 1924.

Archer, W. A. The morphological development of *Asterosporium Hoffmanni*. Mycologia **16**: 220–232. *pl. 15, 16.* 14 S 1924.

Arthur, J. C. Fern rusts and their aecia. Mycologia **16**: 245–251. 14 S 1924.

Ashe, W. W. Notes on woody plants. Jour. Elisha Mitchell Sci. Soc. **40**: 43–48. Au 1924.
Including a number of new species and combinations.

Bailey, I. W. The problem of identifying the wood of Cretaceous and later dicotyledons: *Paraphyllanthoxylon arizonense*. Ann. Bot. **38**: 439–451. *pl. 15.* "Jl" 1924.

Bartram, E. B. A variety of *Grimmia anodon*. Bryologist **27**: 59. "Jl" 19 S 1924.

Bartram, E. B. Two new Grimmias from Arizona. Bryologist **27**: 60–64. *pl. 9, 10.* "Jl" 19 S 1924.
Including *Grimmia Santa-ritae* and *Grimmia catalinensis* spp. nov.

Bates, C. G., & Roeser, J. Relative resistance of tree seedlings to excessive heat. U. S. Dept. Agr. Bull. 1263: 1–16. *f. 1.* 3 S 1924.

Beardslee, H. C., & Coker, W. C. The Mycenas of North Carolina. Jour. Elisha Mitchell Sci. Soc. **40**: 49–91. *pl. 6–30.* Au 1924.
Including *Mycena anomala* sp. nov.

Bose, S. R. Three new species of Bengal Polyporaceae. Bot. Gaz. **78**: 119–121. *f. 1–3.* 15 S 1924.

Bradley, W. H. An oil shale and its microörganisms from the Fuson formation of Wyoming. Am. Jour. Sci. **8**: 228–234. *f. 1–4.* S 1924.

Braid, K. W. *Pleurothallis nervosa* Braid [sp. nov.]. Kew Bull. Misc. Inf. **1924**: 201–202. 17 Je 1924.

Braid, K. W. *Spiranthes* (*Euspiranthes*) *Pamii* Braid [sp. nov.]. Kew Bull. Misc. Inf. **1924**: 204–205. 17 Je 1924.
Including three new varieties.

Braid, K. W. *Stenorrhynchus bonariensis* (Lindl.) Braid, comb. nov. Kew Bull. Misc. Inf. **1924**: 205–206. 17 Je 1924.

Braun, H. A gradient permeability to iodin in wheat seed coats. Jour. Agr. Res. **28**: 225–226. 19 Ap 1924.

Britton, E. G. The mosses of El Yunque. Bryologist **27**: 64-65. "Jl" 19 S 1924.

Bryan, M. K. Bacterial leafspot of *Delphinium*. Jour. Agr. Res. **28**: 261–270. *pl. 1–4.* 19 Ap 1924.

Campbell, D. H. A remarkable development of the sporophyte in *Anthoceros fusiformis* Aust. Ann. Bot. **38**: 473–483. *f. 1–8.* Jl 1924.

Campbell, E. G. Nitrogen content of weeds. Bot. Gaz. **78**: 103–115. *f. 1–4.* 15 S 1924.

Cannon, W. A. General and physiological features of the vegetation of the more arid portions of southern Africa, with notes on the climatic environment. Carnegie Inst. Wash. Publ. 354: i–viii, 1–158. *pl. 1–31.* Au 1924.

Castetter, E. F. Studies on the cytology of of *Melilotus alba*. (Abstract) Proc. Iowa Acad. Sci. **30**: 331. 1 Jl 1924.

Carleton, M. A. Some remarks on the literature of the rust fungi. Science II. **60**: 360–362. 17 O 1924.

Carsner, E., & Stahl, C. F. Studies on curly-top disease of the sugar beet. Jour. Agr. Res. **28**: 297–320. *f. 1 + pl. 1–5*. 26 Ap 1924.

Child, C. M. Physiological foundations of behavior. i–xiii, 1–330. *f. 1–147*. New York, 1924.

Chrysler, M. A. Harnessing the sun: can botanists solve the motor-fuel problem? Jour. N. Y. Bot. Gard. **25**: 266–268. O 1924.

Clarke, J. M. Buried jungle tells flower's story. Evidence of struggle to produce bloom found in ancient trees of Catskills. N. Y. Times, 7 S 1924. (Illust.)

Clarkson, E. H. *Dryopteris dilatata*, var. *americana* in eastern Massachusetts. Am. Fern Jour. **14**: 67–69. *pl. 5*. "Jl–S" 29 S 1924.

Clute, W. N. Elementary species of *Rudbeckia*. Am. Bot. **30**: 158–159. O 1924.

Clute, W. N. On plant names. Gardeners' Chron. Am. **28**: 255. O 1924.

Clute, W. N. Perennial four o'clocks. Am. Bot. **30**: 139–140. O 1924. (Illust.)

Clute, W. N. Plant names and their meanings—XXI. Orchidaceae. Am. Bot. **30**: 145–153. O 1924.

Clute, W. N. Through an insect's eyes. Gardeners' Chron. Am. **28**: 232. S 1924.

Conner, A. B., & Karper, R. E. Inbreeding grain sorghum. Jour. Hered. **15**: 299–302. *f. 20–21*. "Jl" 19 S 1924.

Couch, J. N. Some observations on spore formation and discharge in *Leptolegnia*, *Achlya*, and *Aphanomyces*. Jour. Elisha Mitchell Sci. Soc. **40**: 27–42. *pl. 4–5*. Au 1924.

Cook, W. S. The structures of some nectar glands of Iowa honey plants. Proc. Iowa Acad. Sci. **30**: 301–329. *pl. 1–10.* 1 Jl 1924.

Crozier, W. J., & Federighi, H. Critical thermal increment for the movement of *Ocillatoria*. Jour. Gen. Physiol. **7**: 137–150. *f. 1–6.* 20 S 1924.

Davidson, A. *Calochortus lanternus* and *Allium grandisceptrum* n. spp. Bull. So. Calif. Acad. Sci. **23**: 126. "Jl–Au" 12 S 1924.

Davis, W. H. Summary of investigations on clover rusts. Mycologia **16**: 203–219. *pl. 14* + *f. 1–4.* 14 S 1924.
Including *Uromyces hybridi* sp. nov.

Doolittle, S. P. Control of cucumber mosaic in the greenhouse. U. S. Dept. Agr. Circular 321: 1–5. *pl. 1, 2.* Jl 1924.

Fitzpatrick, T. J. The arborescent flora of midwest farmsteads. Proc. Iowa Acad. Sci. **30**: 359–364. 1 Jl 1924.

Gilmore, K. Methods of modeling Agaricaceae. Proc. Iowa Acad. Sci. **30**: 369–374. *f. 1–5.* 1 Jl 1924.

Haenseler, C. M. Plant diseases of New Jersey. What causes them (first installment). N. J. Agriculture **6**: 10–11. O 1924. (Illust.)

Hanna, W. F. Growth of corn and sunflowers in relation to climatic conditions. Bot. Gaz. **78**: 200–214. *f. 1–4.* 16 O 1924.

Hansen, A. A. Bittersweet, most decorative of wild fruits. Nat Mag. **4**: 283, 300. N 1924. (Illust.)

Hansen, A. A. The cardinal flower, a vanishing species. Nat. Mag. **4**: 224–225. O 1924. (Illust.)

Harris, J. A., Gortner, R. A., Hoffman, W. F., Lawrence, J. V., & Valentine, A. T. The osmotic concentration, specific electrical conductivity, and chlorid content of the tissue fluids of the indicator plants of Tooele Valley, Utah. Jour. Agr. Res. **27**: 893–924. 22 Mr 1924.

Holbert, J. R., Burlison, W. L., Koehler, B., Woodworth, C. M., & Dungan, G. H. Corn root, stalk, and ear rot diseases,

and their control through seed selection and breeding. Illinois Agr. Exp. Sta. Bull. 255: 478. *f. 1–86* + *pl. 1–6*. Au 1924.

Hollick, A. A review of the fossil flora of the West Indies, with descriptions of new species. Bull. N. Y. Bot. Gard. **12:** 259–323. *pl. 1–15*. 13 S 1924.

Hollick, A., & Berry, E. W. A late Tertiary flora from Bahia, Brazil. Johns Hopkins Univ. Studies in Geology **5:** 1–136. *pl. 1–13*. 1924.

Holroyd, R. Morphology and physiology of the axis in Cucurbitaceae. Bot. Gaz. **78:** 1–44. *f. 1–5* + *pl. 1–3*. 15 S 1924.

Hutchinson, J. Contributions towards a phylogenetic classification of flowering plants: III. The genera of Gymnosperms. Kew Bull. Misc. Inf. **1924:** 49–66. 3 Ap 1924; IV. Proposed rearrangement of families comprising the Archichlamydeae. Ibid. 114–134. 29 My 1924. (Illust.)

Jean, F. C., & Weaver, J. E. Root behavior and crop yield under irrigation. Carnegie Inst. Wash. Publ. 357: 1–66. *pl. 1–6*. S 1924.

Johnston, I. M. New plants of Portuguese West Africa collected by Mrs. Richard C. Curtis. Contr. Gray Herb. **73:** 31–40. *pl. 1, 2*. 1924.
Including 12 new species in various genera.

Johnston, I. M. On some South American Proteaceae. Contr. Gray Herb. **73:** 41–42. 1924.

Johnston, I. M. Studies in the Boraginaceae—III. Contr. Gray Herb. **73:** 42–78. 1924.
Including descriptions of many new species and genera.

Jones, D. F. Methods of seed corn production being revised. Jour. Hered. **15:** 291–298. *f. 13–19*. "Jl" 19 S 1924.

Kearney, T. H. A hybrid between different species of cotton. Jour. Hered. **15:** 309–320. *f. 24–34*. "Jl" 19 S 1924.

Kearney, T. H., & Scofield, C. S. The salt content of cotton fiber. Jour. Agr. Res. **28:** 293–295. 19 Ap 1924.

Knuth, R. Dioscoreaceae, in A. Engler, Pflanzenreich **4[32]**: 1–387. *f. 1–69.* 1924.

Latour, B. Associations vitales des champignons avec d'autres végétaux. Le Naturaliste Canadien **51**: 40–46. Au 1924.

Latour, B. Origine des plantes cultivées. Le Naturaliste Canadien **51**: 35–40. Au 1924.

Lee, H. A. Dry rot of citrus fruits caused by a *Nematospora* species. Philippine Jour. Sci. **24**: 719–732. *f. 1* + *pl. 1–2.* Je 1924.

Lisk, H. Cellular structure of tendrils. Bot Gaz. **78**: 85–102. *f. 1–5.* 15 S 1924.

Lloyd, C. G. Myc. Notes **72**: 1269–1300. *f. 2769–2902.* Je 1924.

Lowe, R. L. Collecting mosses on Mt. Ktaadn, Maine. Bryologist **27**: 57–59. "Jl" 19 S 1924.

Lyon, C. J. The effect of phosphates on respiration. Jour. Gen. Physiol. **6**: 299–306. *f. 1–4.* 20 Ja 1924.

Malloch, W. S., & Malloch, F. W. Species crosses in *Nicotiana*, with particular reference to *N. longiflora* × *N. Tabacum*, *N. longiflora* × *N. Sanderae*, *N. Tabacum* × *N. glauca.* Genetics **9**: 261–291. "My" 17 S 1924.

Maneval, W. E. A method of securing spores of yeast. Bot. Gaz. **78**: 122–123. 15 S 1924.

Mangelsdorf, P. C. Waxy endosperm in New England maize. Science II. **60**: 222–223. 5 S 1924.

Manns, T. F., & Phillips, C. E. Corn rootrot studies. Jour. Agr. Res. **27**: 957–964. *pl. 1–4.* 22 Mr 1924.

McCutcheon, M., & Lucke, B. The mechanism of vital staining with basic dyes. Jour. Gen. Physiol. **6**: 501–507. 20 My 1924.

Moore, B., Richards, H. M., Gleason, H. A., & Stout, A. B. Hemlock and its environment. Bull. N. Y. Bot. Gard. **12**: 325–350. 13 S 1924.

Munz, P. A. Southern California plant notes. II. Bull. So. Calif. Acad. Sci. **23**: 127–132. "Jl–Au" 12 S 1924.

Orton, C. R. Seed-borne parasites—a general consideration of the problem. Science II. **59**: 539–546. 20 Je 1924.

Overholts, L. O. Mycological notes for 1921–22. Mycologia **16**: 233–239. *pl. 17, f. 1.* 14 S 1924.

Pack, A. N., & Pack, E. Autumn leaves. Nat. Mag. **4**: 242–244, 251. O 1924.

Pammel, L. H. A day near Muskogee, Oklahoma. Proc. Iowa Acad. Sci. **30**: 295–296. 1 Jl 1924.

Pammel, L. H. The flora of Pine Hollow, Dubuque County, Iowa. Proc. Iowa Acad. Sci. **30**: 263–277. *f. 1–14.* 1 Jl 1924.

Pammel, L. H. The occurrence of *Juniperus horizontalis* in Floyd County near Rockford. Proc. Iowa Acad. Sci. **30**: 297–300. 1 Jl 1924.

Pammel, L. H., & Cratty, R. I. Some notes on plants of Whitehall, Michigan. Proc. Iowa Acad. Sci. **30**: 279–285. *f. 1–7.* 1 Jl 1924.

Pammel, L. H., & King, C. M. Germination studies of some trees and shrubs. Proc. Iowa Acad. Sci. **30**: 287–293. *f. 1–13.* 1 Jl 1924.

Peltier, G. L., & Frederich, W. J. Further studies on the relative susceptibility to citrus cancer of different species and hybrids of the genus *Citrus*, including the wild relatives. Jour. Agr. Res. **28**: 227–239. 19 Ap 1924.

Peltier, G. L., & Frederich, W. J. Relation of environmental factors to citrus scab caused by *Cladosporium Citri* Massee. Jour. Agr. Res. **28**: 241–254. 19 Ap 1924.

Pope, W. T. The Guatemalan avocado in Hawaii. Hawai Agr. Exp. Sta. Bull. **51**: 1–24. *pl. 1–10.* 16 Au 1924.

Reagan, A. B. The flora of the Olympic Peninsula, Washington. Proc. Iowa Acad. Sci. **30**: 201–243. 1 Jl 1924.

Reed, H. S., & Haas, A. R. C. Some relations between the growth and composition of young orange trees and the concentration of the nutrient solution employed. Jour. Agr. Res. **28:** 277–284. *pl. 1.* 19 Ap 1924.

Rhine, L. E. Divergence of catalase and respiration in germination. Bot. Gaz. **78:** 46–67. *f. 1–4.* 15 S 1924.

Robertson, C. Flowers and insects—XXIII. Bot. Gaz. **78:** 68–84. 15 S 1924.

Robinson, B. L. Records preliminary to a general treatment of the Eupatorieae—IV. Contr. Gray Herb. **71:** 3–31. 1924.

Including new species in *Ophryosporus* (2), *Eupatorium* (14), *Mikania* (11).

Rosenfeld, A. H. A beneficial aspect of the sugar cane mosaic disease. Internat. Sugar Jour. **26:** 191–195. Ap 1924.

Rosenfeld, A. H. The cause of mosaic disease of sugar cane. A step toward the solution of this mystery. Internat. Sugar Jour. **26:** 535–536. O 1924.

Round, E. M. Correlation of fossil floras of Rhode Island and New Brunswick. Bot. Gaz. **78:** 116–118. *f. 1–4.* 15 S 1924.

Rydberg, P. A. Some senecioid genera—I. Bull. Torrey Club **53:** 369–378. 18 S 1924; II. Ibid. 409–420. 24 O 1924.

Including descriptions of a number of new species and new combinations.

Schmitz, H. Preliminary note concerning physiological specialization in *Fomes pinicola* Fr. Science II. **60:** 248–249. 12 S 1924.

Schulz, O. E. Cruciferae-Sisymbrieae in Engler. Pflanzenreich 4^{105}: 1–388. *f. 1–74.* 1924.

Scott, W. What is the relation between the moisture content and viability of seed corn when subjected to low temperatures? Proc. Iowa Acad. Sci. **30:** 254–262. 1 Jl 1924.

Seaver, F. J. Destructive fungi. Jour. N. Y. Bot. Gard. **25:** 253–255. S 1924.

Setchell, W. A. Three new fungi. Mycologia **16:** 240–244. *pl. 18, 19.* 14 S 1924.

Including *Daleomyces* gen. nov., *Daleomyces Gardneri* sp. nov., *Acrospermum candidum* sp. nov. and *Thecaphora Ruppiae* sp. nov.

Seward, A. C. On a new species of *Tempskya* from Montana: *Tempskya Knowltoni* sp. nov. Ann. Bot. **38**: 485–507. *f. 1–3 + pl. 16, 17.* "Jl" 1924.

Shear, C. L. The failure of the principle of priority to secure uniformity and stability in botanical nomenclature. Science II. **60**: 254–258. 19 S 1924.

Small, J. K. Pant novelties from Florida. Bull. Torrey Club **51**: 379–393. 18 S 1924.
Including new species and genera.

Small, J. K. The silver-palm—*Coccothrinax argentea*. Jour. N. Y. Bot. Gard. **25**: 237–242. *pl. 296, 297.* S 1924.

Sprague, T. A. Humboldt and Bonpland's Mexican itinerary. Kew Bull. Misc. Inf. **1924**: 20–27. 27 F 1924. (Map.)

Stanton, T. R., Stephens, D. E., & Gaines, E. F. Markton, an oat variety immune from covered smut. U. S. Dept. Agr. Circular 324: 1–8. *f. 1.* Jl 1924.

Stoneback, W. J. A paradise found. Am. Jour. Pharm. **96**: 667–674. S 1924. (Illust.)

Stout, A. B. Coloration in ornamental foliage plants. Jour. N. Y. Bot. Gard. **25**: 248–250. S 1924.

Toole, E. H., & Drummond, P. L. The germination of cotton-seed. Jour. Agr. Res. **28**: 285–291. *pl. 1–2.* 19 Ap 1924.

Uphof, J. C. T. On Mendelian factors in radishes. Genetics **9**: 292–304. *f. 1–3.* "My" 17 S 1924.

Van Horn, M. W. Some conditions affecting tree growth as revealed by the annual rings. Proc. Iowa. Acad. Sci. **30**: 367–368. 1 Jl 1924.

Waldron, L. R. A study of dwarfness in wheat accompanied by unexpected ratios. Genetics **9**: 212–246. *f. 1.* "My" 17 S 1924.

Waugh, F. A. The spruce gall. Horticulture II. **2**: 489. 15 S 1924.

Wieland, G. R. Recent achievements in paleobotany. Science II. **60**: 233–235. 12 S 1924.